

The World's Water

Peak Water, China's Growing Disaster, and
Solutions to the World's Water Crisis

Dr. Peter H. Gleick
Pacific Institute
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Pacific
Institute

The World's Water

The Biennial Report on Freshwater Resources

The World's Water

2000-2001

The Biennial Report on Freshwater Resources

- Water as a human right
- Water stocks and quality
- Water and food security
- Desalination
- International water law
- Water recycling
- Dam removals
- Water events

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The Biennial Report on Freshwater Resources

2002-2003

The Soft Path for Water
Globalization of Water
Water Privatization
Water Indices
Colorado River Delta
Water in Space
Turkey's GAP Project
World Commission on
New Water Data

Peter Gleick
with

William C.G. Burns • Elizabeth L. Cullen
Michael Cohen • Katherine Kao Cushing •
Rachel Reyes • Gary H. Wolff • Arlene

THE WORLD'S WATER

2004-2005

The Biennial Report on Freshwater Resources

Peter H. Gleick

Nicholas L. Cain

Dana Haasz

Christine Henges-Jeck

Michael Kiparsky

Marcus Moench

Meena Palaniappan

Veena Srinivasan

Gary H. Wolff

- Urban Water Use Efficiency
- Groundwater
- UN Millennium Goals for Water
- Bottled Water
- Human Right to Water
- Water and Conflict
- California Water Policy and Climate Change
- The 3rd World Water Forum

THE WORLD'S WATER

2006-2007

The Biennial Report on Freshwater Resources

Peter H. Gleick

Heather Cooley

David Katz

Emily Lee

Jason Morrison

Meena Palaniappan

Andrea Samulon

Gary H. Wolff

- Business Risks of Water
- Floods and Droughts
- Desalination
- Environmental Justice
- Water and Terrorism
- Ecosystem Services
- Bottled Water
- Water and Conflict Chronology Update



THE WORLD'S WATER

2008–2009

The Biennial Report on Freshwater Resources

Peter H. Gleick

Heather Cooley

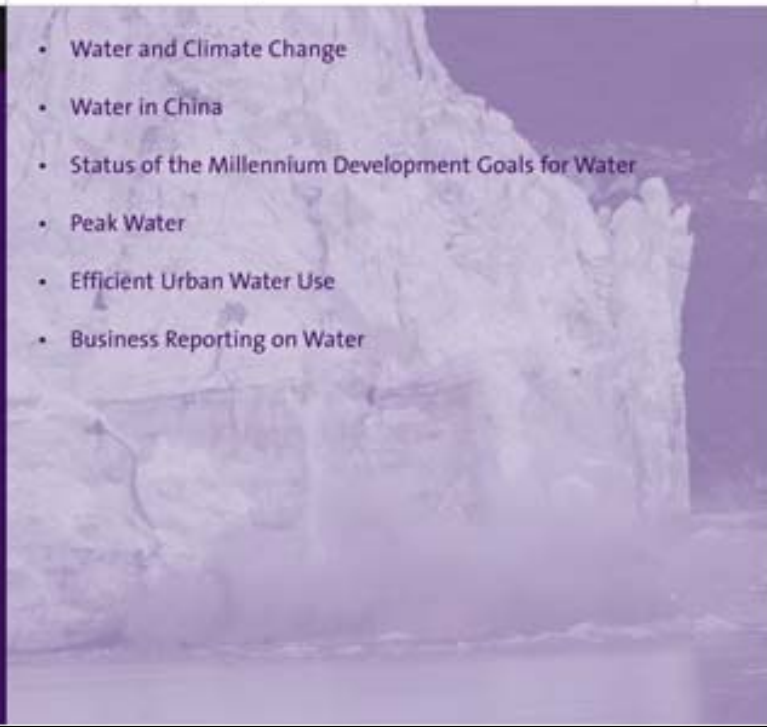
Michael J. Cohen

Mari Morikawa

Jason Morrison

Meena Palaniappan

- Water and Climate Change
- Water in China
- Status of the Millennium Development Goals for Water
- Peak Water
- Efficient Urban Water Use
- Business Reporting on Water



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 - Meena Palaniappan
 - Jason Morrison
 - Mari Morikawa
 - Michael Cohen
-
- Foreword by Malin Falkenmark
 - And Island Press and Todd Baldwin

What's New in The World's Water 2008-2009

- “Peak Water” The Next Oil?
- Water and Climate
- Business Reporting on Water
- China and Water
- The Millennium Development Goals
- Urban Water Efficiency
- ***In Briefs:*** The Salton Sea; Tampa Bay’s Desalination Plant; Three Gorges Dam; Water and Conflict
- Data

The Water “Crisis:” What is it?

Peak Water?

Water and China

Solutions for the New Century

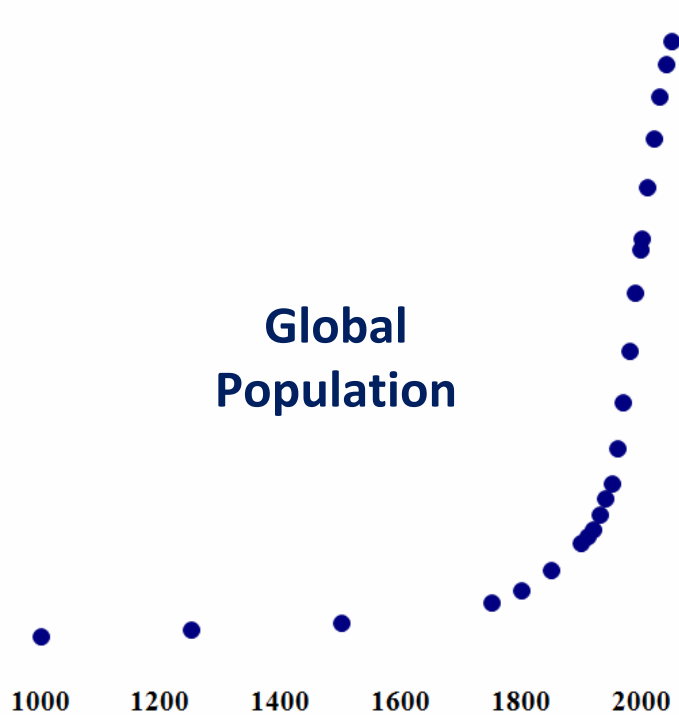
The Water Crisis: What is It?

Global and Regional Challenges

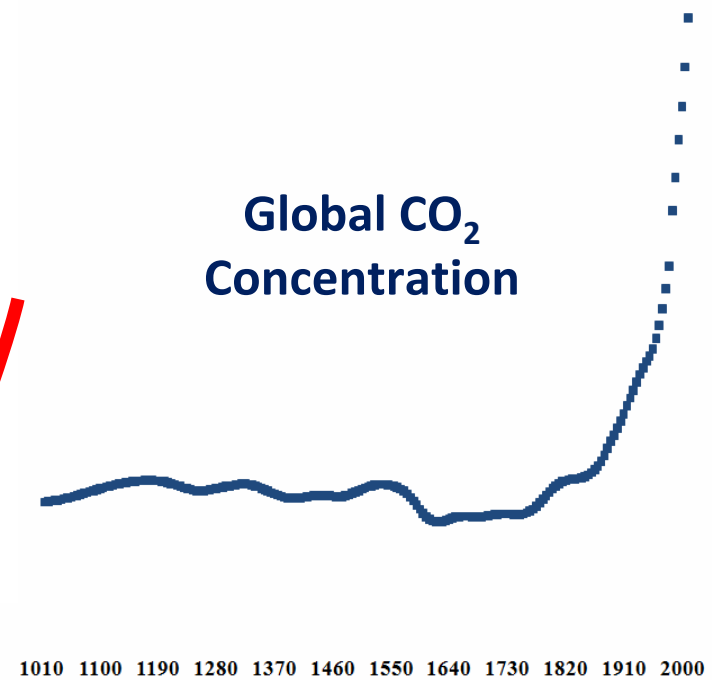
- The failure to meet basic human needs
- Water-related diseases
- Local water scarcity and resource depletion
- Water contamination
- The effects of climate change and extreme events
- Challenges to the production of food, goods, and services
- Ecosystem degradation and destruction
- Threats to national and international security

“Peak Water” in Three Easy Shapes

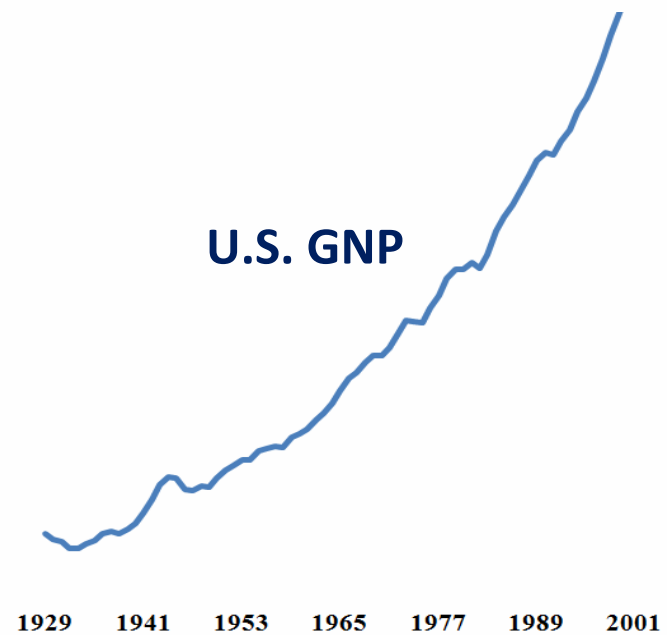
**Global
Population**



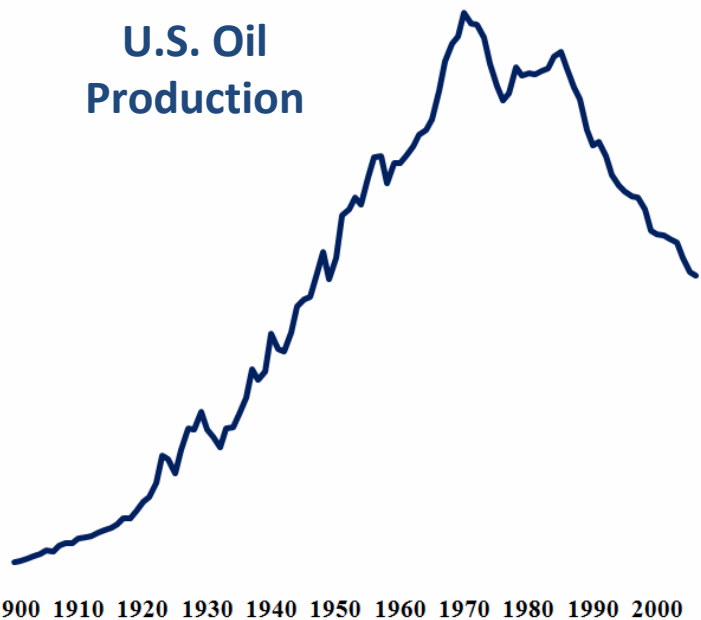
**Global CO₂
Concentration**



U.S. GNP



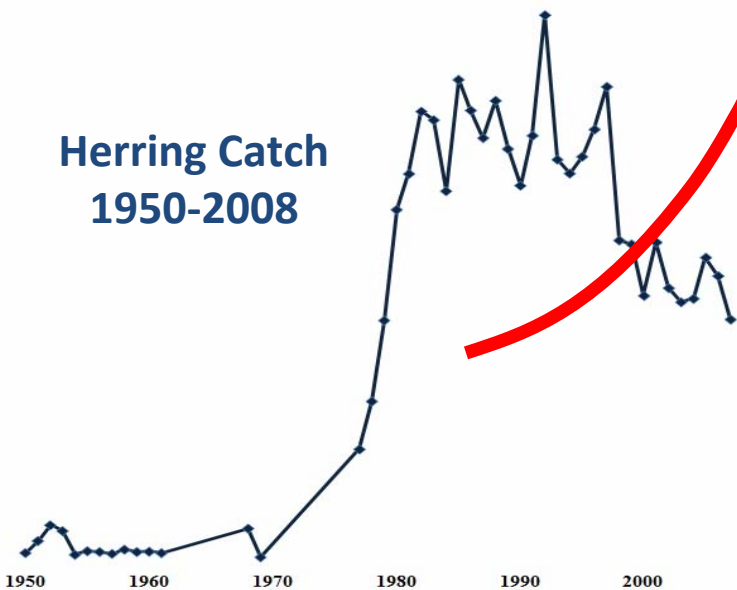
**U.S. Oil
Production**



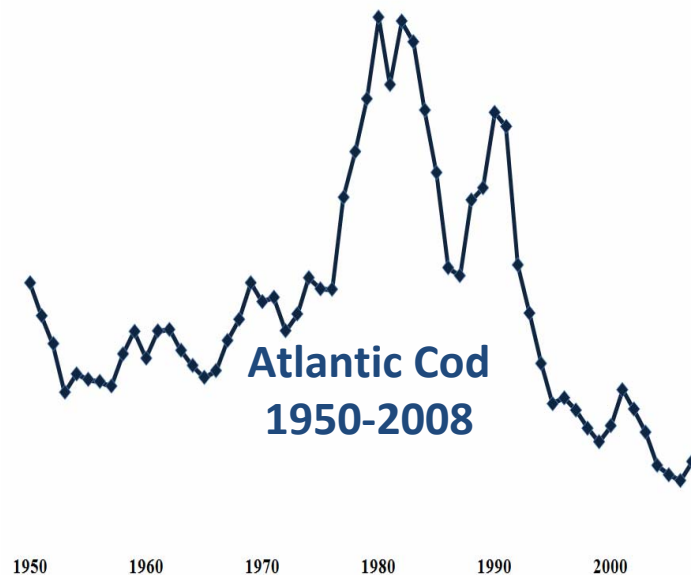
**DJIA:
2002-2009**



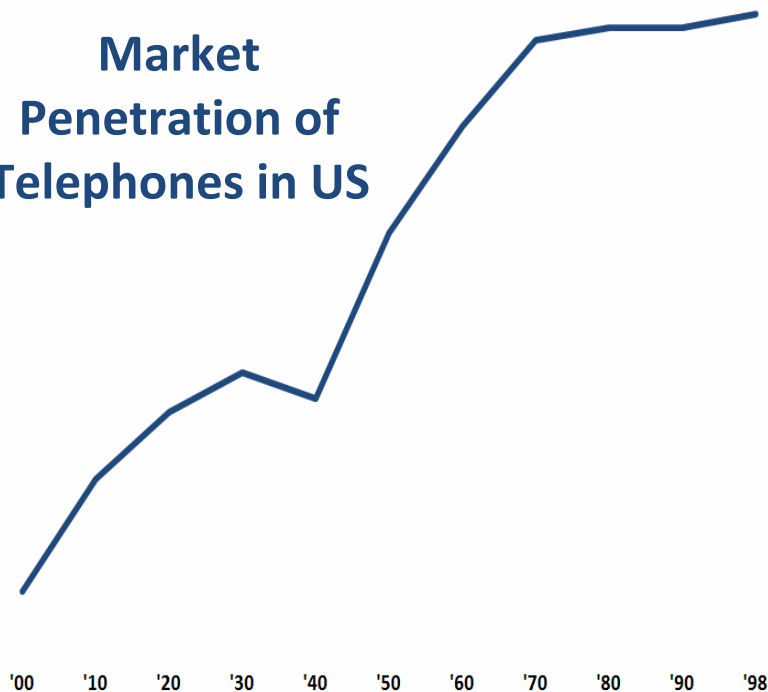
**Herring Catch
1950-2008**



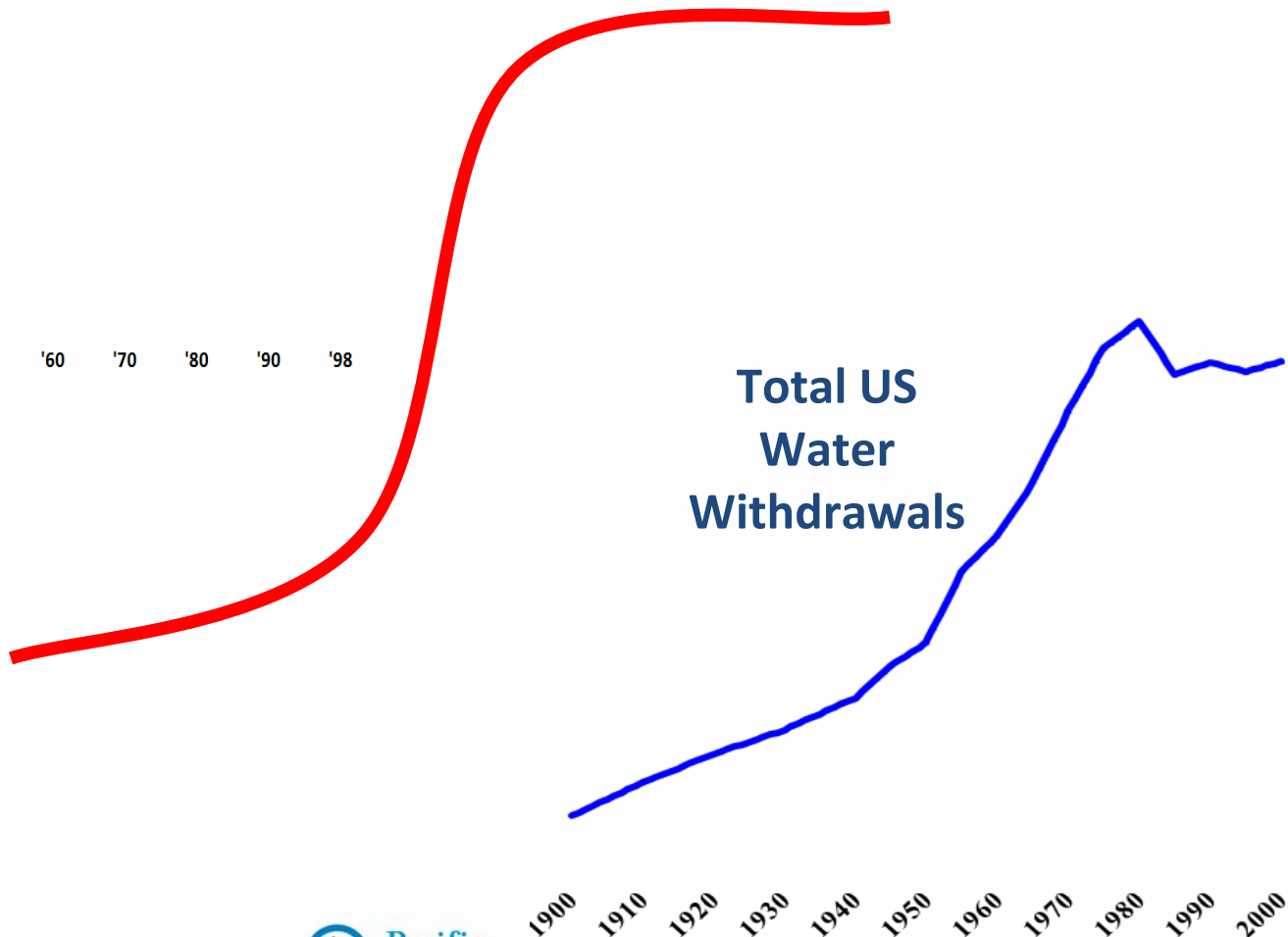
**Atlantic Cod
1950-2008**



Market Penetration of Telephones in US



Total US Water Withdrawals



Oil and Water



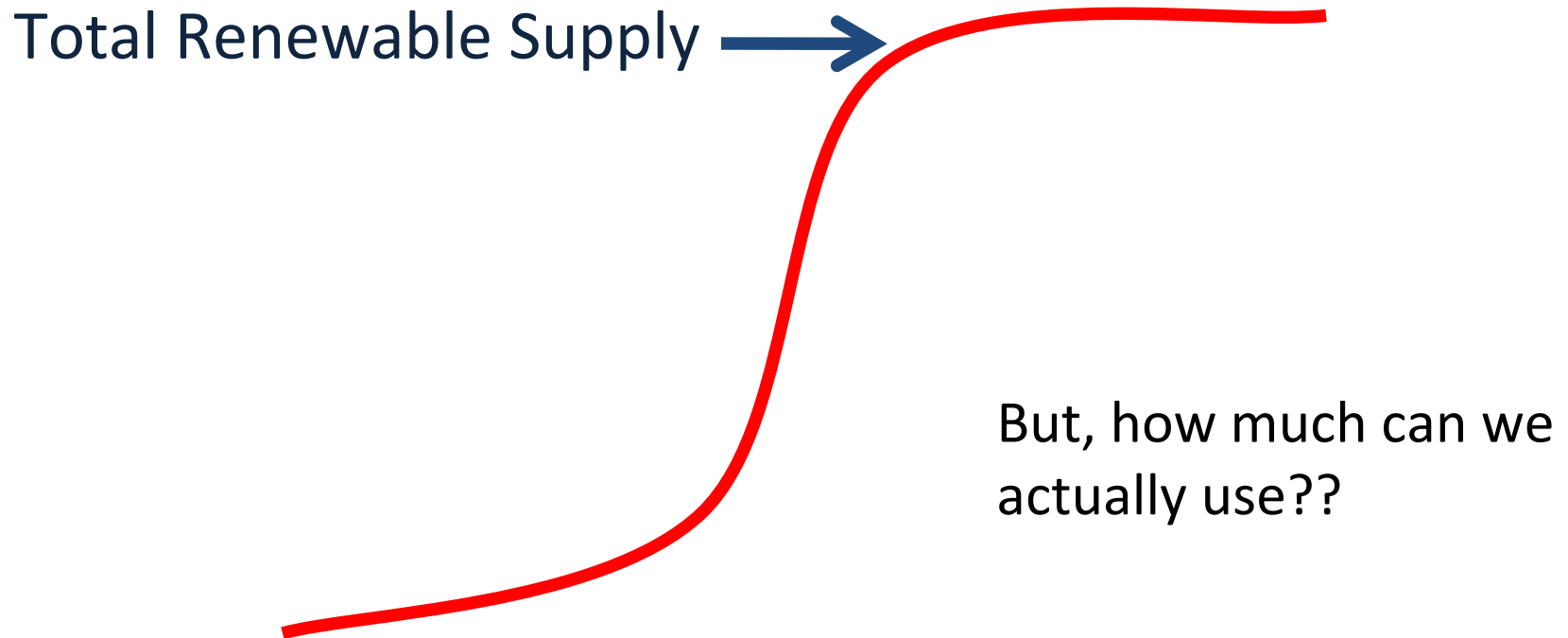
Oil and Water: Selected Characteristics

<i>Characteristic</i>	<i>Oil</i>	<i>Water</i>
Quantity?	Finite	Literally finite, but unlimited (at a cost)
Renewable or Non-Renewable?	Non-renewable	Renewable, but with locally non-renewable stocks
Transportability?	Long-distance transport economically viable	Long-distance transport not economically viable
Substitutability?	Wide range of alternatives can substitute	No substitutes for most purposes

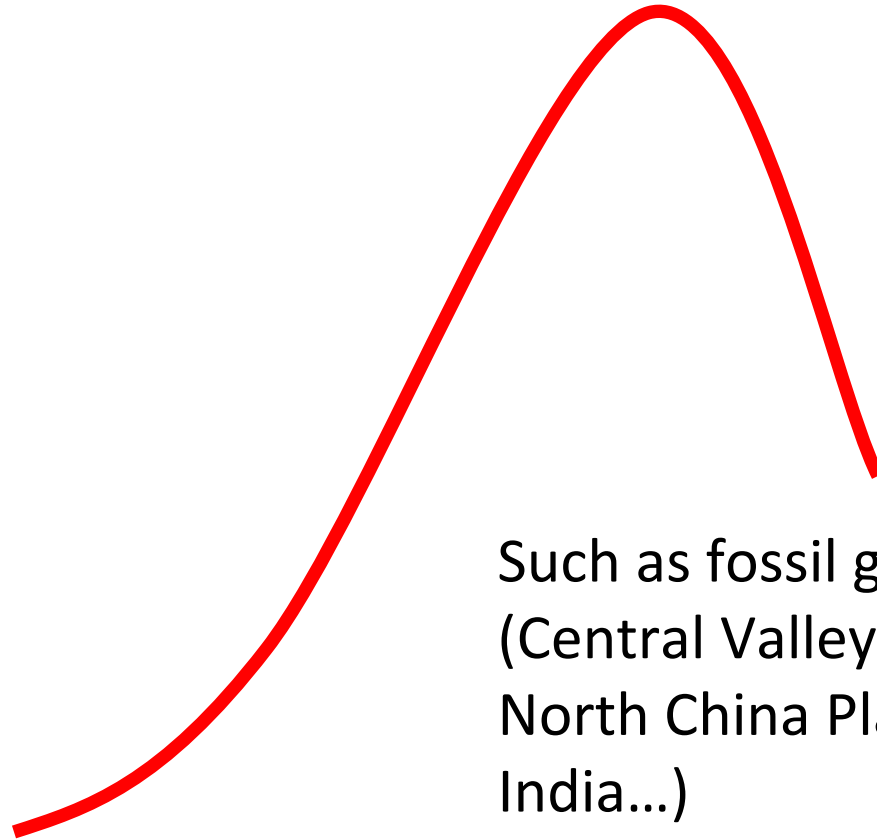
Renewable or Non-Renewable?

- Non-renewable resources are “stock” limited.
- Renewable resources are “flow” limited.
- Water uniquely exhibits characteristics of both: overall renewable but with some fixed, isolated non-renewable stocks.

Peak Renewable Water

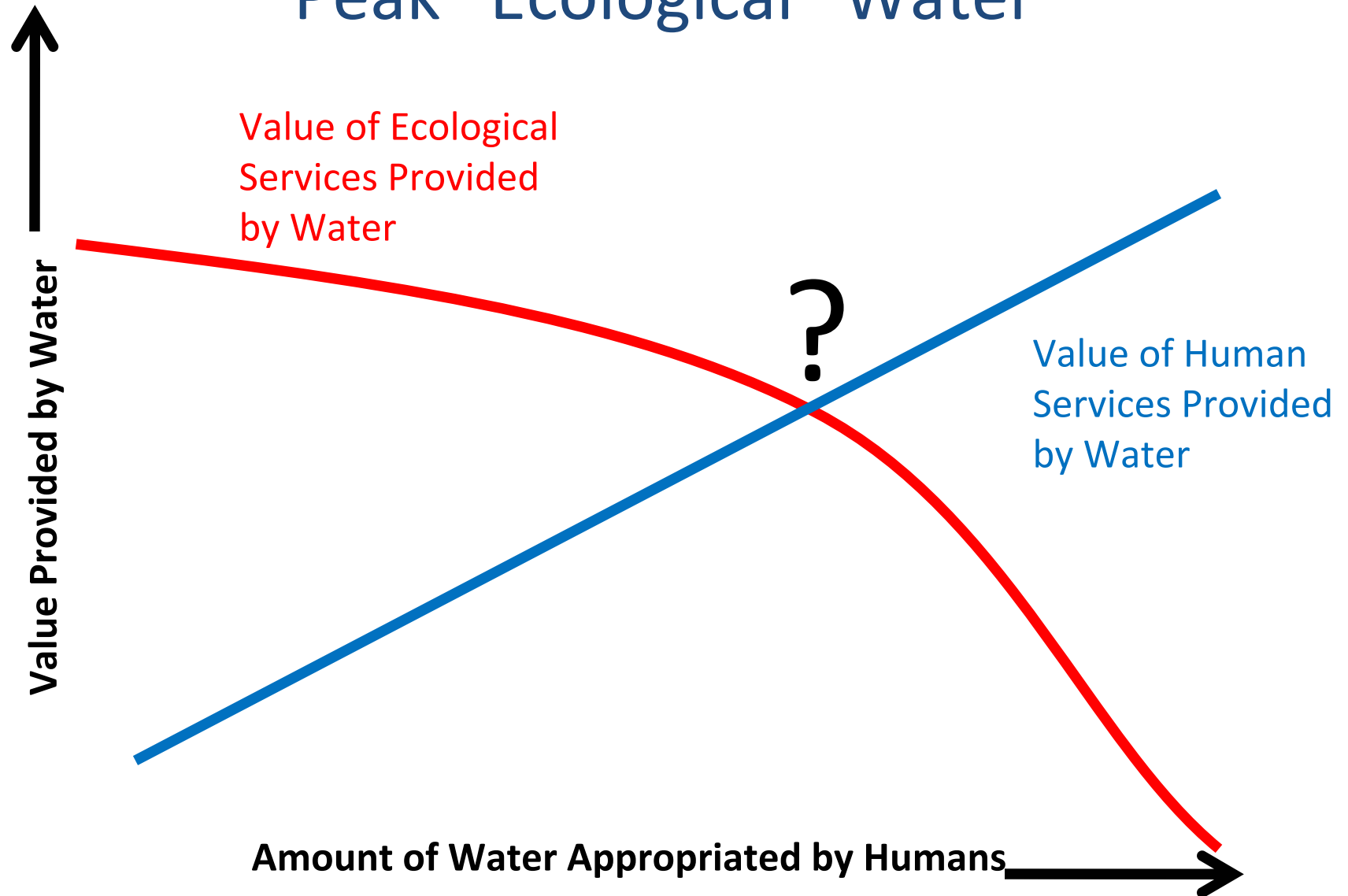


Peak “Non-Renewable” Water

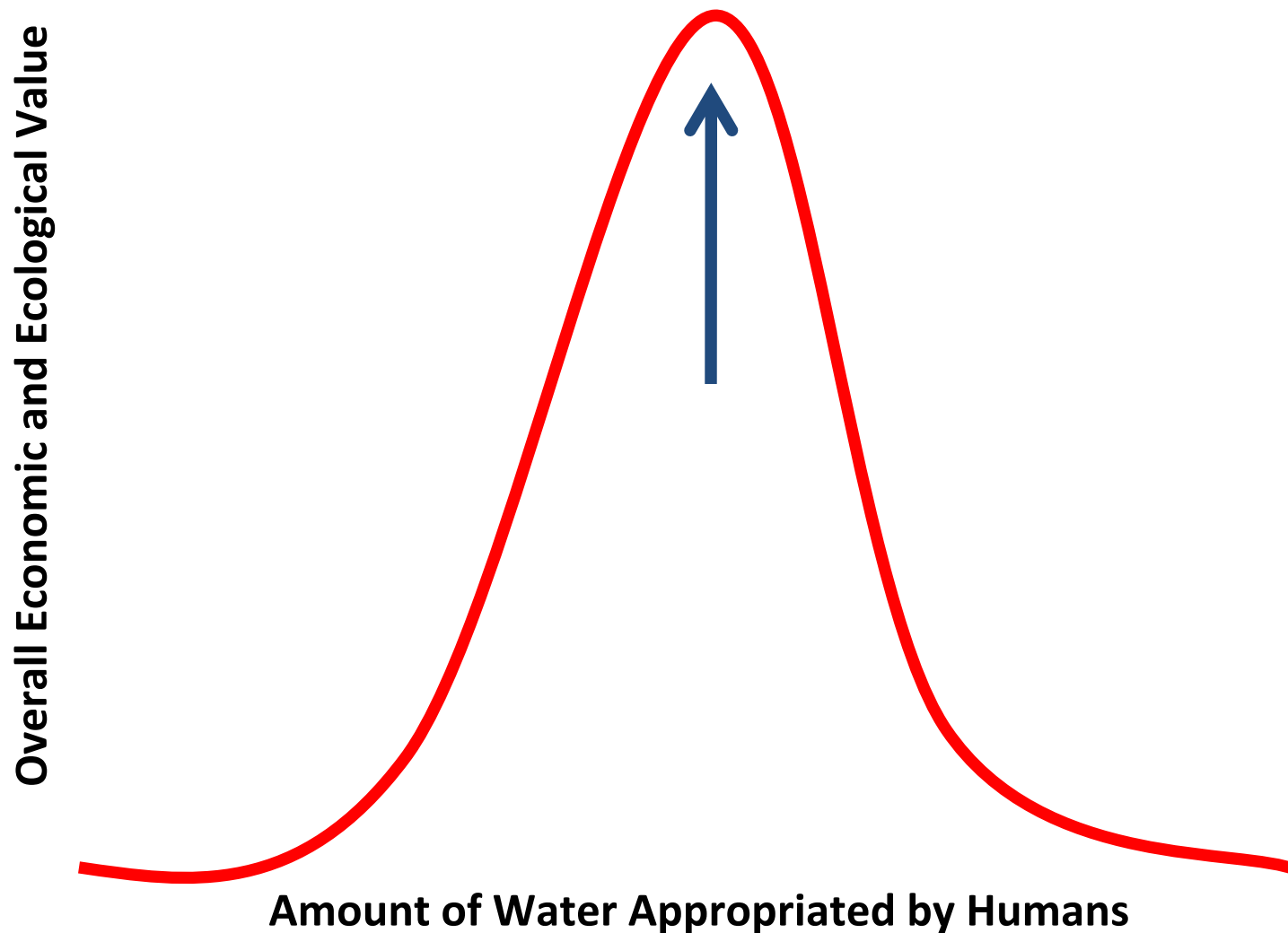


Such as fossil groundwater
(Central Valley, Ogallala, Libya,
North China Plains, central
India...)

Peak “Ecological” Water



Peak “Ecological” Water



So, What Does Peak Water Mean?

- We'll never “run out” of water overall. It is (mostly) renewable.
- Where water is “non-renewable” we *will* run into stock constraints.
- We will run up against “flow” limits that are a combination of natural and economic constraints.
- We are increasingly hitting (or exceeding) peak “ecological” water limits.

Peak Water and China

- The remarkable growth in China's economy over the past two decades has come at tremendous cost to their environment, especially air and water.
- China's water resources are overallocated, inefficiently used, and grossly polluted by human and industrial wastes.
- They suffer from both “peak water” constraints and “peak ecological water” limits.
- Solutions and opportunities exist to more sustainably manage their water, but change is slow in coming.

China's Water Problems

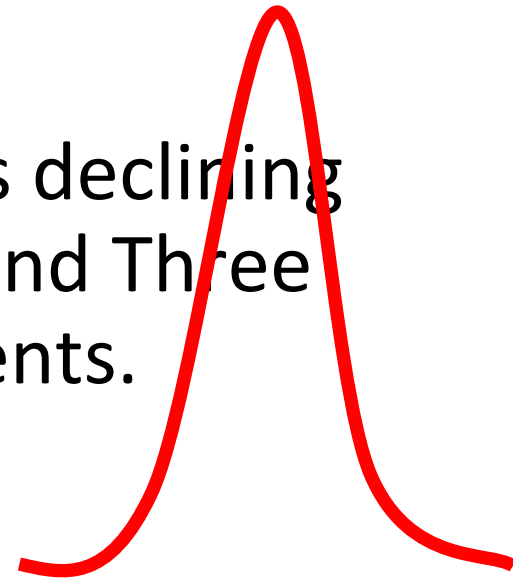
- Chinese scientists are already observing impacts of climate change on China's water.
- Groundwater quality is increasingly degraded by the massive dumping of untreated or partially treated wastewater.
- Desertification in northern China is worsening due to excessive withdrawals of surface and groundwater.
- There is growing internal dissent and conflict over both water allocation and water quality.

Unsustainable Water Use: Peak Water

- A substantial portion of agricultural production relies on unsustainable groundwater use.
- In northern Hebei province, villages are digging 120 to 200 meters to find clean drinking water; a decade ago wells were only 20-30 meters deep.
- Companies are cancelling business ventures because of water concerns.
- Chinese scientists note worsening health due to the use of heavily polluted water.

China's Peak Ecological Water Problem

- 80 percent of the wetlands in the North China Plain have been lost, and natural streams and creeks have dried up.
- Major species have been driven to extinction or are on the verge of extinction because of water infrastructure projects or contamination.
- Productivity in the East China Sea is declining because nutrients are trapped behind Three Gorges Dam and other impoundments.







“There will be no sustainable development in the future if there is no groundwater supply,”

Hydrologist Liu Changming
(Chinese Academy of Sciences)

“The pursuit of economic growth has been the priority overshadowing the vital issues of water resources and ecological balance”

China Daily 2007

In 2007, President Hu Jintao called for:

“...securing more clean drinking water, improving water conservation, water pollution prevention, restricting excessive water resources exploitation and cutting water waste.”

Moving Toward Solutions

- Develop supply, but to higher standards.
- Expand and improve infrastructure.
- Improve water-use efficiency.
- Create stricter standards for water quality.
- Enforce those standards.
- Use proper pricing and markets.
- Improve and expand public participation.
- Fix water institutions.

Fix China's Water Institutions

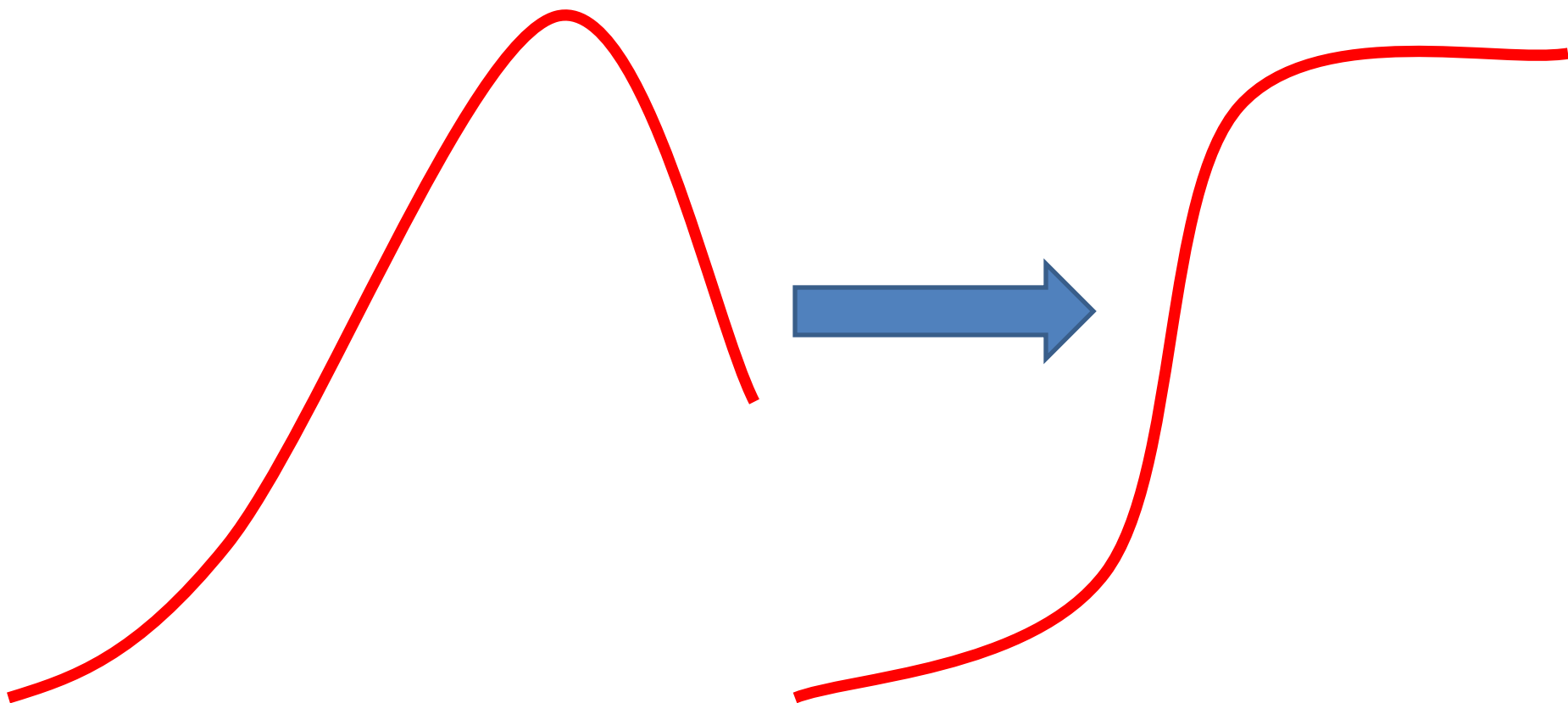
- Water laws are outdated, weak, and inadequately enforced.
- Conflicts between national and provincial powers.
- Little input from non-governmental sources.
- Polluters face vague civil penalties.
- Agency responsibilities and authority conflict.
- Water managers rely too heavily on “supply” infrastructure rather than demand management.
- Pricing and market mechanisms are rare, and inadequately applied.

Conclusions

- There is a real water “crisis”
 - In different forms, in different regions.
- We will never “run out” of water, but
 - We are past the point of “peak ecological water” in many regions. China is not alone.
- Excessive use of water (or inadequate supply) is already constraining industrial production and growth in some regions and sectors.

Conclusions

- Opportunities for the “soft path” abound, but may require new thinking and new approaches.
- Truly sustainable water management and use requires efficiency, smart economics, advanced technology, and better governance and water management.





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China's Water Problems

- 40% of the water in the country's surface waters was fit only for industrial or agricultural use and only after treatment.
- An estimated 20,000 chemical factories, half of which are along the Yangtze River, are dumping uncontrolled or only marginally controlled pollutants into China's rivers.
- In 2006, nearly half of China's major cities did not meet state drinking-water quality standards and a third of surface-water samples taken were considered severely polluted.
- Three hundred million people lack access to safe drinking water. Human health is being affected.
- The economic impacts of both droughts and floods on China's economy are greater than that felt by most industrialized countries.